

# ANEUPLOIDY IN THE MUHLENBERGIA SUBBIFLORA COMPLEX (GRAMINEAE)

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Muhlenbergia subbiflora was described by A. S. Hitchcock (North American Flora 17(6): 437. 1935), based on an annual plant, Palmer 948 from Durango, Mexico. Another collection from the same locality, Palmer 731 is also cited. These two Palmer collections had been determined as Chaboissaea ligulata Fourn. by Scribner & Merrill, who made the transfer to Muhlenbergia, as M. ligulata (Fourn.) Scribn. & Merr. (U.S.D.A. Div. Agrostol. Bull. 24: 19. 1901). Chaboissaea ligulata, however is a perennial with a considerably different habit. Scribner & Merrill's transfer is quite legitimate, and is the valid name for C. ligulata if one considers it to belong in the genus Muhlenbergia. It is not the correct name for Muhlenbergia subbiflora A. S. Hitchcock.

We first collected Muhlenbergia subbiflora in 1963 in a marshy area just east of Ciudad Durango. Examination of anther squashes from this gathering revealed a chromosome number of  $2n = 16$ . This was interesting, since the species frequently has two, or even three, florets per spikelet, and for that reason is somewhat anomalous in Muhlenbergia, in which the chromosomes are usually multiples of 10. Perhaps M. subbiflora had been improperly assigned. It should be pointed out, however, that it is not unusual to encounter two-flowered spikelets in other species of Muhlenbergia, e.g. M. asperifolia (Nees & Mey.) L. Parodi. Two years later we collected M. subbiflora again, this time in a region of cienegas some 65 km north of Cd. Durango, and to our surprise determined a chromosome number of  $2n = 14$ !

The following year on a trip to Mexico, we made a point of visiting localities in which Muhlenbergia subbiflora had been found previously, along with other habitats in which we thought it might occur. Chromosome counts from these gatherings were even more frustrating. Two collections yielded  $2n = 14$ , one  $2n = 16$ , and a fourth  $2n = 18$ . We were reluctant to publish these numbers until we had acquired a better understanding of what was happening in these populations. We were not in M. subbiflora country again until 1974. On that trip, seven collections were made north and northeast of Ciudad Durango. Of the seven, four were  $2n = 14$ , two were  $2n = 16$ , and one was  $2n = 18$ . It can be seen that in our sampling, 14 was the most common number (seven counts), followed by 16 (four counts), but the number 18 appeared twice. One might logically ask whether the basic number for this taxon is  $x = 7, 8$ , or 9? Another annual but apparently not closely related, M. filiformis (Thurb.) Rydb., is known to have a chromosome number of  $2n = 18$ .

During the 1966 trip, and again in 1967, we collected and were able to make chromosome counts of the related Muhlenbergia decumbens

Swallen, which is known only from the state of Chihuahua. We determined  $2n = 32$  in three different gatherings of this taxon, suggesting, perhaps, a tetraploid based on  $x = 8$ . The related M. subbiflora, which had caused us so much trouble, might be a diploid with  $2n = 16$ , and the 14 and 18 counts could be interpreted as aneuploids.

The reader is reminded that Scribner & Merrill determined Muhlenbergia subbiflora as Chaboissaea liquilata. That species also has two or three florets per spikelet, which suggests a relationship to the annuals we had been examining. We reported a chromosome count of  $2n = 16$  for this latter species, based on a collection from Zacatecas (Bull. Torrey Bot. Club. 94: 1--17. 1967), and this number was subsequently confirmed in two additional gatherings from the state of Durango (Bull. Torrey Bot. Club 95: 69--86. 1968).

Several years ago, in a paper presented at the AIBS Meetings in Corvallis, Oregon (Abstracts of Papers to be presented at the Meeting of the Bot. Soc. Amer. and certain affiliated groups, 17--22 August, 1975, pg. 58) we reported chromosome numbers of  $2n = 16$  for Muhlenbergia subbiflora, and  $2n = 32$  for M. decumbens, and suggested that these two taxa were members of the genus Chaboissaea. At that time we did not report aneuploidy in M. subbiflora, expecting to have an opportunity to study the populations further. Moreover, we did not make the indicated transfers then nor subsequently. We offer them here:

Chaboissaea decumbens (Swallen) J. & C. Reeder comb. nov.

Muhlenbergia decumbens Swallen, Bol. Soc. Bot. Mexico 23: 30. 1958. Type: Mexico: Chihuahua, Hernandez X. & Tapia J. N-359 (US-2237023).

Chaboissaea subbiflora (A. S. Hitchcock) J. & C. Reeder comb. nov.

Muhlenbergia subbiflora A. S. Hitchcock, North Amer. Flora 17: 437. 1935. Type: Mexico: Durango, Palmer 948 (US-995434)

Returning to aneuploidy in the subbiflora taxon, it is of interest that all seven collections in which we had determined a chromosome number of  $2n = 14$ , had predominately 1-flowered spikelets. In those with a  $2n$  number of 16 or 18, most of the spikelets had two florets, although in one with  $2n = 16$ , our 6488a, the spikelets usually had a single floret. Plants with differing chromosome numbers do not appear to be concentrated in a particular area. Although the  $2n = 14$  plants, the most numerous in our sample, were mostly found in an area 29--41 miles (46--66 km) north of Ciudad Durango, we encountered one population with this number 10 miles (16 km) northeast of the city. Concerning the  $2n = 16$  gatherings, three of these were about 4 miles (6 km) east of Cd. Durango, but one came from 26 miles (42 km) north of the city. Of the two with  $2n = 18$ , one of these was 4 miles (6 km) east of the city, whereas the other was 22 miles (35.4 km) north of Cd. Durango.

In spite of the fact that the  $2n = 14$  chromosome number dominated in our samples, we believe that it is reasonable to conclude that  $x = 8$  is the basic number, and that the plants with a pair of chromosomes more or less than this are aneuploids. This concept is strengthened by the fact that the similar, and obviously related decumbens taxon was found to have  $2n = 32$ , which we interpret as tetraploid, and that the perennial, and clearly related Chaboissaea has been demonstrated to be diploid with  $2n = 16$  chromosomes. The fact that plants making up the subbiflora taxon appear similar whether they have 14, 16, or 18 chromosomes is a subject for further investigation.

As indicated, the annual plants discussed above are all found in cienegas or other marshy habitats. For the record, chromosome vouchers are listed below. Collection numbers are those of John R. & Charlotte G. Reeder. The specimens are at ARIZ; duplicates will be distributed to US. Although some of the gatherings are from the same general area, each represents an individual plant, and in a number of cases they were made in different years. Since these plants are annual, collections in different years must, perforce, represent different plants.

Chaboissaea decumbens ( $2n = 32$ )

Mexico: Chihuahua: 11 mi (17.7 km) W of Cuauhtémoc, 7600 ft (2316 m), 5 Oct 1966, 4593, 4601; 4 Sep 1967, 4848.

Chaboissaea subbiflora

( $2n = 14$ )

Mexico: Durango: 40 mi (64.5 km) N of Cd. Durango, 6400 ft (1950 m), 1 Sep 1965, 4485; 41 mi (66 km) N of Cd. Durango, 6500 ft (1980 m), 5 Oct 1974, 6479, 6481; 39 mi (63 km) N of Cd. Durango, 6400 ft (1950 m), 9 Oct 1966, 4636; 34 mi (55 km) N of Cd. Durango, 6400 ft (1950 m), 5 Oct 1974, 6485; 29 mi (46.7 km) N of Cd. Durango, 6400 ft (1950 m), 9 Oct 1966, 4640; 10 mi (16 km) NE of Cd. Durango, 6300 ft (1920 m), 5 Oct 1974, 6491.

( $2n = 16$ )

Mexico: Durango: 4 mi (6.5 km) E of Cd. Durango, 6300 ft (1920 m), 26 Sep 1963, 3828; 9 Oct 1966, 4643; 5 Oct 1974, 6488a; 26 mi (42 km) N of Cd. Durango 6400 ft (1950 m), 5 Oct 1974, 6487.

( $2n = 18$ )

Mexico: Durango: 4 mi (6.5 km) E of Cd. Durango, 6300 ft (1920 m), 5 Oct 1974, 6488; 22 mi (35.4 km) N of Cd. Durango, 6400 ft (1950 m), 9 Oct 1966, 4642.